Mohawk valley community college  
Utica and Rome New york

COURSE OUTLINE

Mechanical Systems MT 139

4.0 Credit Hours

1. Course or Catalog Description:

MT139 Mechanical Systems **C-2 P-4 Cr-4**

This course is a study of the basic mechanical components in a complex mechatronics system. Topics include basic functions and physical properties of mechanical components and the roles they play in the system such as materials, lubrication requirements and surface properties, as well as troubleshooting techniques and strategies used to identify, localize, and correct malfunctions. Concepts in systemic preventative maintenance and mechanical component safety are presented along with technical documentation such as data sheets and specifications of mechanical elements.

1. Corequisites:

ET111 Electrical Systems

ET127 Modern Industrial Practice

MA105 Technical Math 1

1. STUDENT LEARNING OUTCOMES:

Upon successful completion of the course, a student will be able to:

1. Describe the role of OSHA and the purpose of MSDS sheets.
2. Demonstrate the use of PPE and safe dress in working in the lab.
3. Describe the use of machine guarding and the LOTO procedure.
4. Demonstrate the proper and safe use of hand tools and measurement tools.
5. Identify and differentiate between threaded fasteners and select correct fastener types for applications.
6. Describe the six basic mechanical machines.
7. Demonstrate an understanding of the concept of friction.
8. Demonstrate an understanding of what troubleshooting is and will describe basic troubleshooting skills.
9. Be able to list troubleshooting aids and how they are used in locating problems in mechanical systems.
10. Define various industrial lubrication terms such as viscosity, flash point, pour point, inhibitors, and additives.
11. Describe shaft specifications and materials.
12. Describe the basic mechanical principles behind the need for bearings.
13. Calculate fits and clearances between shafts and bearings.
14. Select the correct bearing for a basic application based on load ratings, life, tolerances, speed, temperature, and lubrication.
15. Describe the differences and characteristics of plain bearings, rolling-element bearings, ball bearings, roller bearings, and needle bearings.
16. Demonstrate correct procedures for working with bearings.
17. Describe the types of lubrication that different bearings require.
18. Identify different types of couplings and demonstrate an understanding of their use applications.
19. Demonstrate an understanding the types of shaft misalignment and alignment methods.
20. Use a straight edge, feeler gage, dial calipers, and/or laser alignment tools to align two shafts.
21. Describe what a mechanical power transmission system is and will give examples of different types of power transmission systems using couplings, clutches, belts, chains, gears, etc.
22. Demonstrate an understanding of how power flows through a mechanical system using belts, chains, or gears.
23. Demonstrate an understanding of the safety issues that are a part of working with belt, chain, and gear drive systems.
24. Recognize the components of belt, gear, and chain drive systems.
25. Define common belt, gear, and chain drive terminology and types.
26. Demonstrate an understanding of belt-numbering systems and chain types.
27. Calculate shaft speed, sheave or gear ratio, and torque of a drive system.
28. Demonstrate how to measure and adjust belt tension on a belt drive system and chain tension on chain drive system and perform troubleshooting on drive systems.
29. Demonstrate an understanding of what preventive maintenance needs to occur on mechanical drive components to keep them running at optimal condition.
30. Demonstrate an understanding of the advantages and disadvantages of belt, chain, and gear drive systems.
31. Demonstrate an understanding of the safety issues that can arise when installing gaskets, seals, and packing.
32. Explain the need for gaskets, seals, and packing.
33. Distinguish between static and dynamic seals.
34. Identify different types of gaskets and gasket materials and be able to select the correct gasket material for an application.
35. Describe stuffing boxes – their purpose, their parts, their packing material, and what to look for as signs of problems when installing new packing.
36. Explain what automatic or molded packing is and will describe the advantages of it.
37. Describe what radial lip seals are and will understand the concept of installation for retention versus installation for exclusion.
38. Describe what mechanical seals are, will explain the advantages of them, will describe internal versus external mounting, and will be able to classify them as balanced of unbalanced.
39. Know what to look for when installing mechanical seals.
40. Explain what labyrinth seals are and what their advantages are.
41. Determine service factors for worm gear reducers using a table.
42. Install and align a gear or belt drive system.
43. Analyze a gear drive for backlash and will adjust the system until it is in the allowable range.
44. Describe the general procedures for preventive maintenance of gearboxes.
45. Use roller chain numbering systems (sizing code) to identify chains.
46. Describe types of chain drive sprockets and hub classes.
47. Calculate torque, shaft speed, and speed ratios for chain drives install and align a chain drive system.
48. Use tables based on horsepower and rpm to select chain size and required number of sprocket teeth for applications.
49. Describe and demonstrate how to measure chain tension.
50. Troubleshoot basic chain, gear, and belt drive system
51. Demonstrate an understanding of what needs to be done to repair belt, chain, or gear drive systems.
52. Demonstrate an understanding of what preventive maintenance needs to occur on the mechanical chain drive components to keep them running at optimal condition.
53. Demonstrate an understanding of the functions and properties of the gear drive system as a whole.
54. Calculate shaft speed, torque, and gear ratios of a gear drive system.
55. Demonstrate an understanding of the lubrication requirements of open gear systems.
56. DETAILED COURSE OUTLINE:

Topics

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| --- | --- | --- |
| Lecture 1 GW Cpt 4 Maintenance Tools |  | (1 period) |
| Lecture 2 GW Cpt 5 Fasteners |  | (1 period) |
| Lecture 3 C Cpt 4 Lubrication |  | (1 period) |
| Lecture 4 GW Cpt 9 Power transmission |  | (1 period) |
| Lecture 5 C Cpt 3 Basic Principals of Mechanical |  | (1 period) |
| Lecture 6 GW Cpt 9 Power transmission |  | (1 period) |
| Lecture 7 GW Cpt 10 Bearings, seals, lubrication |  | (1 period) |
| Lecture 8 GW Cpt 11 Shafts, Coupling Alignment |  | (1 period) |
| Lecture 9 GW Cpt 12 Belts Pullies, chains, etc. |  | (1 period) |
| Lecture 10 C Cpt 11 Print reading |  | (1 period) |
| Lecture 11 GW Cpt 8 Rigging |  | (1 period) |
| Lecture 12 GW Cpt 13 Conveyors |  | (1 period) |
| Lecture 13 GW Cpt 14 troubleshooting |  | (1 period) |
| Lecture 14 GW Cpt 15 Fluid power |  | (1 period) |

GW - Industrial Maintenance and Mechatronics

C - Industrial Mechanics and Maintenance

**COURSE NAME:** \_\_\_\_\_\_\_\_ **MT 139 Mechanical Systems**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **DATE** | **FACULTY NAME** | **CHANGE** | **INPUT** | **MEASUREMENT** | **ASSESSMENT** | **ACTION** |
| 1/14/16 | M. Higgins | Clean up format |  |  |  |  |
| 1/18/16 | M. Higgins | Expand Disclaimers | From NFI |  |  |  |
| 3/17/16 | M. Higgins | Detailed Course Outline and Schedule | From Text |  |  |  |
| 4/20/16 | M. Higgins | Reformat Course Outline and Schedule | From Sybil web page |  |  |  |
| 8/17/17 | M. Higgins | Reformat Course Outline and Schedule | From Sybil web page |  |  |  |
| 1/20/19 | M Higgins | Reviewed to conform to College Standards | Review Standards |  |  |  |
| 8/15/19 | M Higgins | Update CRNs, Sec #’s | SIRS |  |  |  |
| 8/17/20 | M Higgins | Update CRNs, Sec #’s | SIRS |  |  |  |
| 1/7/2021 | M Higgins | Update CRNs, Sec #’s | SIRS |  |  |  |
| 8/17/22 | M Higgins | Update CRNs, Sec #’s | SIRS |  |  |  |
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